

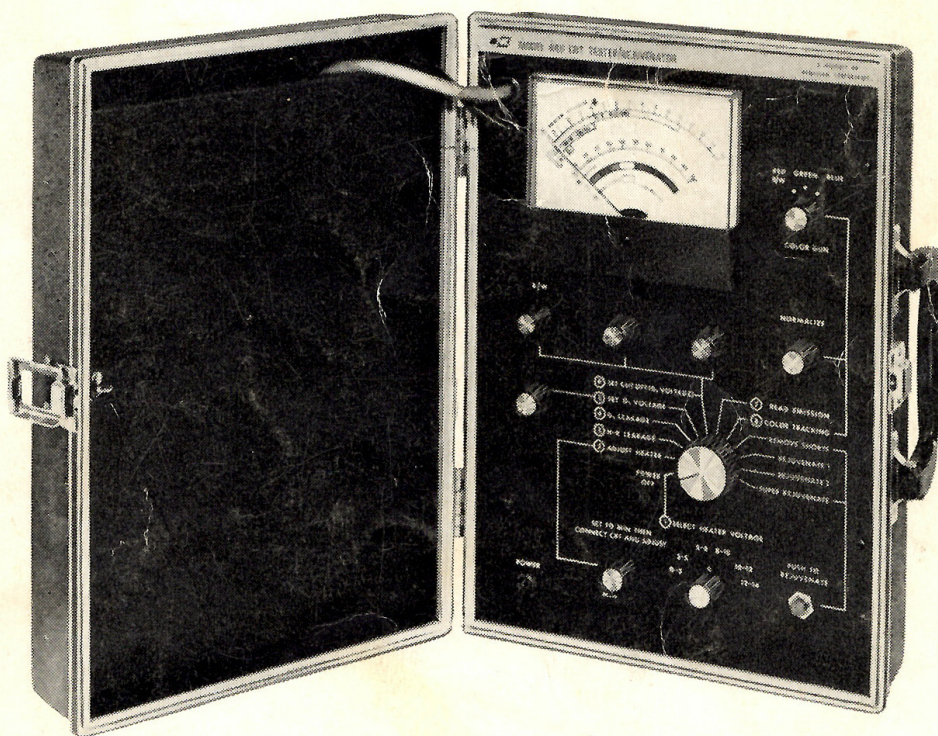
# INSTRUCTION MANUAL

**B&K** Model 466

1970

C26904

## CATHODE RAY TUBE TESTER/REJUVENATOR



Product of DYNASCAN CORPORATION

1801 West Belle Plaine Avenue, Chicago, Illinois 60613





**INSTRUCTION MANUAL**

**FOR**

**Model 466**

**CATHODE RAY TUBE**

**TESTER/REJUVENATOR**

**B & K DIVISION OF DYNASCAN CORPORATION**  
**1801 West Belle Plaine Avenue**  
**Chicago, Illinois 60613**

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## **BRIEF SUMMARY OF WHAT THE MODEL 466 WILL DO**

1. The Model 466 CRT Tester/Rejuvenator will rapidly test a cathode ray tube (using CRT manufacturers' accepted techniques and safeguards) for all the important factors which determine the quality of a tube. The Model 466 will check for shorts or leakage between the elements in the tube and will also indicate between which elements the fault exists.
2. The 466 will check the amount of emission from the cathode (s) and will directly and rapidly indicate relative emission balance between the guns of a color cathode ray tube.
3. The 466 will check the warmup characteristics of a tube.
4. It will repair most common faults in cathode ray tubes, such as shorts between elements, open connections to elements, and inter-element leakage.
5. It will rejuvenate picture tubes having low emission. Other capabilities of the Model 466 are described in the next section.

## **WHY YOUR NEW MODEL 466 IS THE MOST ADVANCED TESTER OF ITS TYPE**

The Model 466 CRT Tester/Rejuvenator has been designed by B&K to accurately evaluate virtually any television cathode ray tube.

This professional quality CRT tester retains the proven, valuable capabilities of its predecessors and also incorporates new important advances. These advances include:

1. A human-engineered control panel which organizes and streamlines the test by guiding the user rapidly through the correct test sequence.
2. Advances in internal circuitry which provide more directly useful features and greater test precision than any comparable tester.
3. A large precision meter which is numerically coded to the front-panel controls to minimize setup time and permit highly accurate, error-free evaluation of the CRT under test.
4. Color-coded: leakage and emission scales.
5.  $G_1$  voltage and heater voltage (right at the tube pins) are precisely monitored on meter.
6. Continuously variable heater voltage, which can be precisely set on meter, effectively protects the instrument from obsolescence by the appearance of future CRTs having new heater voltages.
7. The voltages to grid 1 and grid 2 are continuously variable permitting the tube to be checked under conditions similar to operation of the tube within the receiver.
8. Improved power supply transformer provides greater safety and up-to-date comprehensive coverage of all new filament voltages.
9. New color tracking normalize feature which greatly simplifies color tube evaluation and reduces time for determining proper color gun tracking.
10. New simplified warmup test for color CRTs.
11. Direct metering of relative cathode emission improvement when using any of the Rejuvenate features. This eliminates need to repetitiously

recycle previous test steps, saves time and permits immediately detecting the extent to which rejuvenation should be performed.

12. Simplified life test.
13. Activate mode provides precise metered monitoring of activation.
14. Rejuvenation capability is provided in three improved steps, the first two of which are automatically timed to prevent damage to a tube. The unique Super Rejuvenate feature provides even greater capability for restoring the emission of an aging and otherwise worthless CRT.
15. The largest storage space of any CRT tester currently available.
16. New improved, expanded, more versatile adapter set is included and provides capability to directly test more CRT types than any other currently available tester. For example, even the new Trinitron, 11SP22 and 11WP22 tubes are accurately tested on the 466 without having to obtain additional adapters at added cost.
17. Unlike other CRT testers which allow some of the internal elements of a color CRT under test to "float at random" or to be shorted together (to reduce cost of the tester), in all test modes the 466 insures that all key elements of the color CRT are properly connected to appropriate test circuit points. This permits greater precision in test results and eliminates the real possibility of any uncontrolled, internal current paths injuring the CRT under test.

### **Safety Precautions**

**NOTE:** The proper power line supply voltage is indicated in the line cord storage compartment. Do not attempt to operate this instrument from a power source other than specified.

When testing any CRT that is installed in a chassis, first disconnect the chassis power plug from the AC line outlet. **DO NOT APPLY POWER TO THE CHASSIS AT ANY TIME DURING THE TEST OF THE CRT.** Remove the receiver female socket assembly from the base of the CRT. Always perform test steps carefully.



**Case of weatherproof  
heavyweight ABS plastic  
resists scarring and  
sharp impacts**

**Individual controls adjust  $G_2$   
Voltage for each electron gun  
of CRT under test**

**Storage  
Compartment Door**

**Adapters, power cord,  
instruction manual,  
setup charts and  
other optional  
items store readily  
in hidden compartment**

**Storage  
Door Release**

**Adjusts  $G_1$  Voltage to value  
specified in Setup Chart**

## **BASIC FEATURES OF MODEL 466**



Meter scales are sequentially numbered with circled numbers which tie in with circled numbers on step-by-step front panel of 466 tester.

Color Gun Switch selects electron gun to be tested, activated or rejuvenated. See instructions.

Normalize Control simplifies Color Tracking test

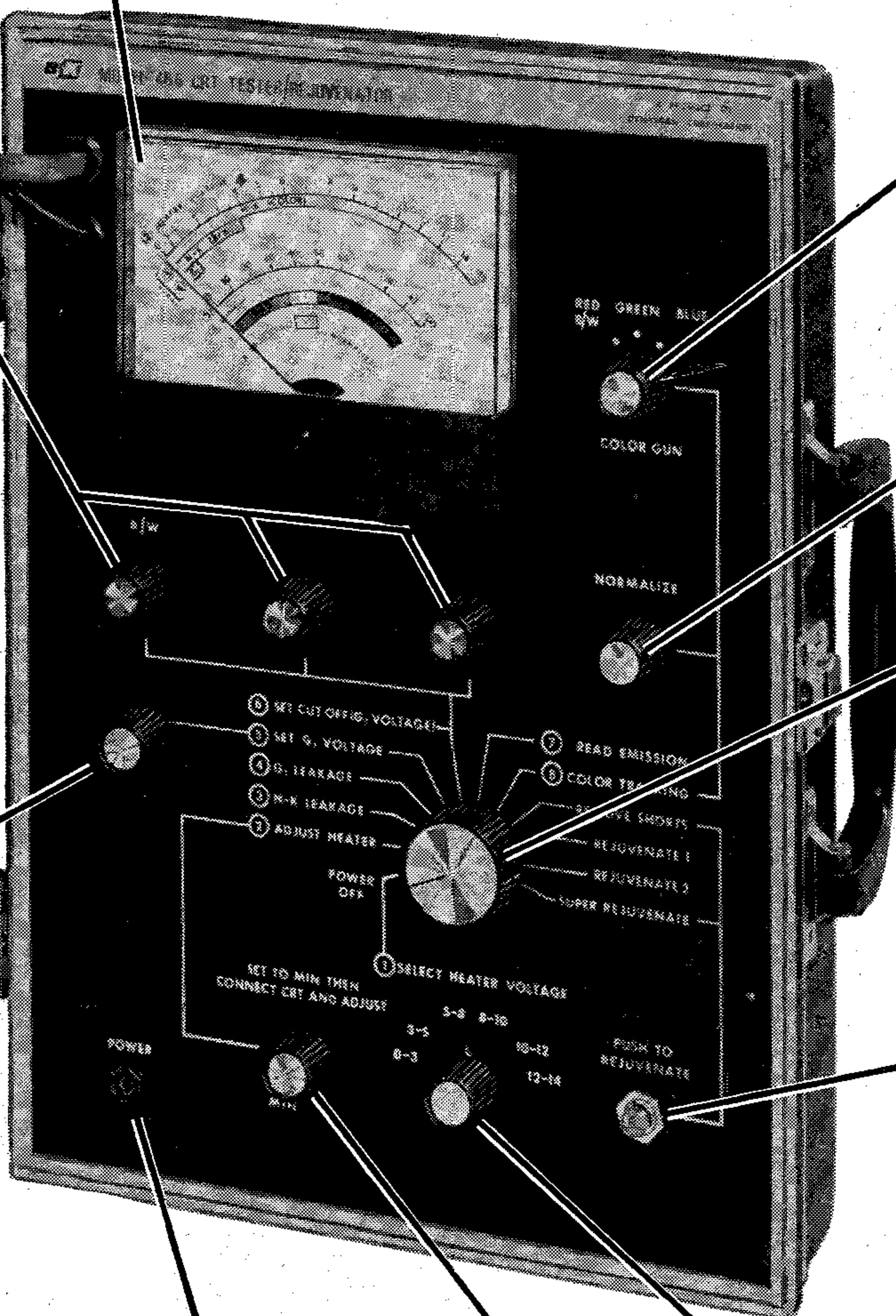
LARGE CENTRAL FUNCTION KNOB CONTROLS STEP-BY-STEP SEQUENCE OF TESTING

RED REJUVENATE PUSHBUTTON (read instructions before using).

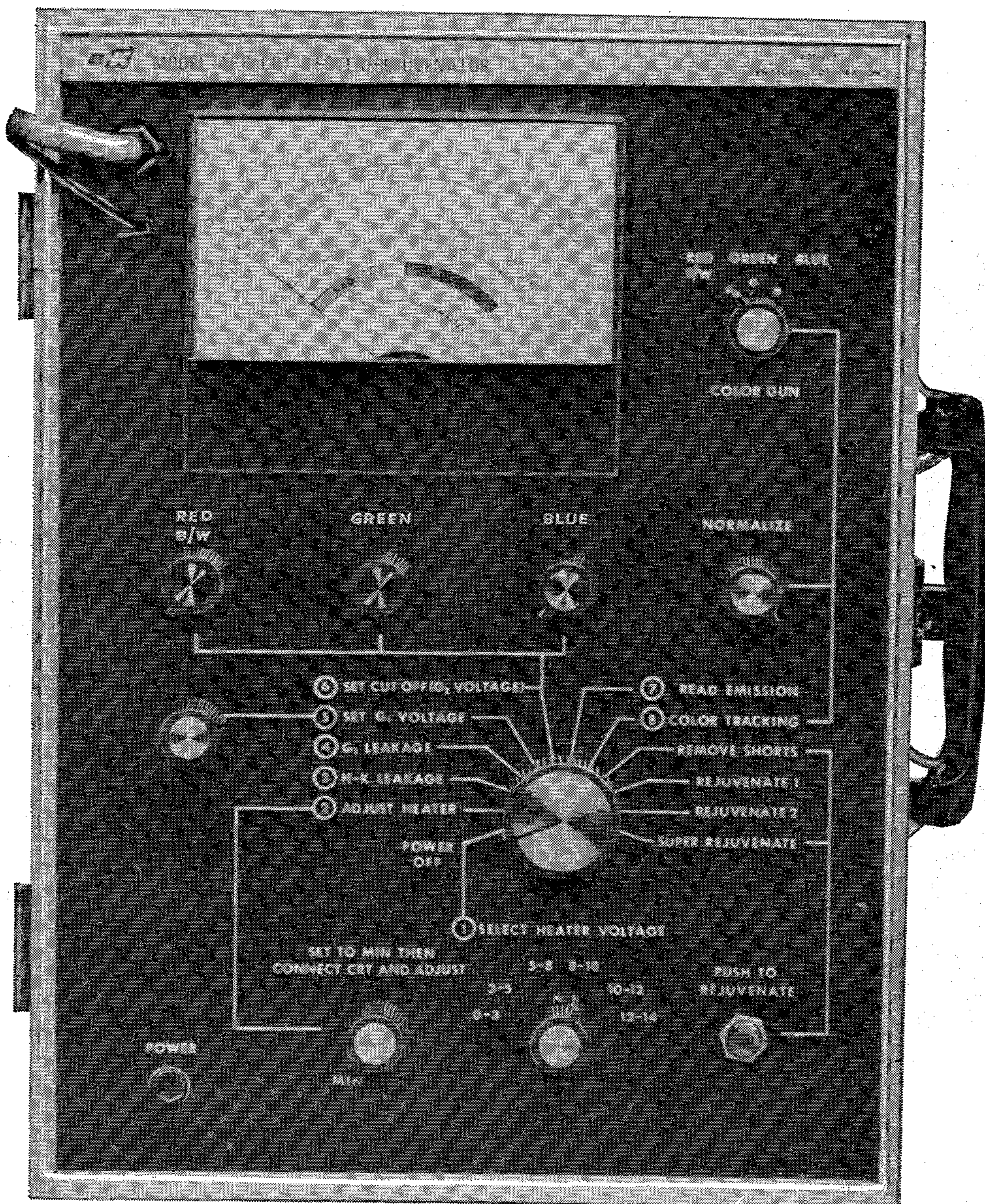
Power On Indicator

Adjusts Heater Voltage to Exact Value specified in Setup Chart

Selects Heater Voltage Range







CONTROL PANEL OF MODEL 466



## PREPARATION FOR TEST

Connect line cord of tester to proper power line outlet, rotate NORMALIZE control completely clockwise and all other controls completely counterclockwise. Find the listing in the test chart for the CRT to be tested. Note the sequential numbering on the front panel of the 466 which will guide you rapidly through the test sequence. Circled numbers below correlate with circled numbers on panel and meter of tester.

The 466 tests both black-and-white and color CRTs in an essentially identical manner, except that the top switch marked COLOR GUN is always kept in the position marked RED/B&W for a black-and-white tube but is switched into each of its three color gun positions for steps ③, ④ ⑥, and ⑦ when testing a color CRT.

## SIMPLIFIED TEST PROCEDURE

① Rotate bottom knob marked ① SELECT HEATER VOLTAGE to proper range as indicated in setup chart.

② Rotate large central function knob to position marked ② ADJUST HEATER. Follow guideline, set small knob to MIN, select adapter indicated in chart, connect CRT, adjust heater voltage as indicated on scale ② of meter to value given in chart. Allow CRT to warmup for at least three minutes. Readjust heater voltage.

③ Rotate the large function knob to ③ H-K LEAKAGE and observe reading on LEAKAGE scale ③ of meter. (There are two scales for H-K leakage. One is for color CRTs and the other for black-and-white CRTs. Be sure to take your reading from the appropriate scale for the type of CRT under test). The colored area indicates the range of permissible leakage. Readings outside this area indicate a defective tube. For a color CRT repeat this step for all positions of the COLOR GUN switch.

④ Rotate the large function knob to ④ G<sub>1</sub> LEAKAGE. Observe meter reading on scale ④. For a color CRT repeat this step for all positions of the COLOR GUN switch. For both black-and-white and color tubes, if the reading is outside the colored area, the tube is defective and should be rejected.

### COMMENTS:

Tap lightly on the neck of the tube during the above leakage tests ③ and ④. Erratic meter readings may indicate an intermittent or short condition. Leakage can be caused by an accumulation of dust at the base pins of the CRT. Cleaning the tube base with a non-toxic, non-conductive solvent such as methyl alcohol, will frequently remedy this problem.

SET HEATER

LEAKAGE & SHORTS TEST

- ⑤ Set large function knob to ⑤ SET  $G_1$  VOLTAGE and using knob ⑤ adjust  $G_1$  voltage on meter scale ⑤ to green line = 45 volts. \*For tubes marked with an asterisk \*, set  $G_1$  to 70 volts.
- ⑥ Set large function knob to position ⑥ and with COLOR GUN switch in position marked RED/B&W adjust B/W RED  $G_2$  voltage control knob until meter pointer reading on meter scale ⑥ increases by two small divisions. (If pointer is beyond limit of scale ⑥ or if you can't adjust pointer by two divisions on scale ⑥, CRT is bad.) For a color CRT perform this step once for each of the three positions of the COLOR GUN switch, using the corresponding control.
- ⑦ Set function switch to ⑦ READ EMISSION and evaluate the emission on meter scale ⑦. If meter reads BAD, reject the tube. If meter reads GOOD, cathode emission is acceptable. For a color CRT, perform this step in all three positions of COLOR GUN switch.

The following step applies only to color CRTs.

- ⑧ a. Set function switch to ⑧ COLOR TRACKING position.
- b. While observing meter pointer, rotate COLOR GUN switch in all three positions, then set to gun with highest reading on meter.
- c. Adjust NORMALIZE control until meter pointer aligns on the right edge of the color tracking rectangle (marked NORMALIZE).
- d. Switch the COLOR GUN switch to each of the other two color guns. If the meter does not read within the boundaries of the color tracking rectangle for all three guns, reject the tube if IN-WARRANTY. If tube is OUT-OF-WARRANTY, consider using ACTIVATE/REJUVENATE procedure for the color gun having the lowest emission reading.

## COMMENTS

A zero reading when the Function Switch is in the READ EMISSION position ⑦ indicates an open  $G_2$  or K element. The  $G_2$  voltage control ⑥ should be set carefully so that erroneous reading and tube damage are avoided.



## **SIMPLIFIED WARMUP TEST FOR COLOR TUBES**

To produce satisfactory colors in operation, the emission of each of the three guns of a color picture tube must approach its normal operating value within a reasonable time period. One of the unique features of the 466 is that it provides a very easy, simplified technique for determining the warm-up characteristics of color tubes as follows.

1. After the standard test steps ① thru ⑦ and the Color Tracking evaluation step ⑧ have been completed on a color tube and the tube has been evaluated as acceptable, leave all settings of the small knobs unchanged and rotate the large function knob to the OFF position for 10 minutes or until CRT cools down completely.
2. Leaving all small knobs still undisturbed, rotate large function knob back to position marked COLOR TRACKING. Wait 2 minutes and then successively rotate the COLOR GUN switch into all three of its positions while observing meter position relative to the acceptable tracking area indicated on scale ⑧ of the meter. If the meter needle deflects into the acceptable color tracking rectangle of scale ⑧ for all guns at the two minute point, the warmup characteristic of the CRT is considered to be acceptable.
3. If any gun failed step ②, above, wait two more minutes and then (leaving all other controls still undisturbed) again rotate the COLOR GUN switch into all three positions while observing meter. If the meter needle deflects into the acceptable color tracking rectangle for all three guns at this time (after a total of four minutes of warmup), the warmup characteristic of the CRT is considered to be marginally acceptable.

## LIFE TEST

1. Set the function switch to position ⑦ READ EMISSION until CRT is up to operating temperature.
2. Rotate bottom right knob ① SELECT HEATER VOLTAGE to lowest range. Note the length of time before the meter needle starts to fall toward zero as the CRT cools down.
3. When testing a color tube, repeat steps ①, and ② for all three color guns.
4. If the meter needle momentarily remains fixed or slightly increases and then slowly drops to zero, the tube is acceptable. If the meter needle begins to slump toward zero rapidly, then the tube cannot be expected to last much longer.

Note: The emission current in "instant on" CRTs (not preheated filaments) can be expected to decrease quite rapidly, since the thermal time constant of the gun structure is much smaller than for conventional CRTs.

Comment: In this test, the useful life of a picture tube is approximately correlated with the "statistical probability" of electrons being emitted from the cathode surface and passing through the aperture of the electron gun. This, in turn, depends on whether the small portion of the cathode surface nearest the aperture can emit electrons efficiently. If there is excess gas in the tube, positive ions will have been drawn through the aperture to this crucial portion of the cathode surface. These ions, on striking the cathode surface, "borrow" electrons from the cathode and become atoms attached to the cathode surface. These "contaminating" atoms thus coat the emission surface with a barrier layer which reduces the "statistical probability" that electrons will be emitted as desired. The slump in current (if observed in step 2) indicates this surface contamination. Since the contamination will continue to increase in a "gassy" tube, such a tube cannot be expected to last much longer. A continuing degradation of the emission current can be expected.



## REMOVING SHORTS

1. Set large function switch to REMOVE SHORTS position.
2. Allow five to ten minutes for the filament to cool. Heater voltage is not applied to the tube during this function.
3. When repairing a color tube, set the COLOR GUN switch to the gun being repaired. For a black-and-white tube, set the switch to the B/W position.
4. Press red REJUVENATE pushbutton momentarily.
5. Repeat the SHORTS test steps ③ and ④ to determine whether or not the short has been removed. If a short has been removed, proceed with emission test (steps ⑤ thru ⑦).

COMMENTS: When the tube in the Shorts test shows a cathode to filament short, do not attempt to repair it. If the tube functions properly in the set, it is unnecessary to do any more to it. However, if the picture is bad (due to possible hum in the picture or no control of brightness), the picture tube can still be used if a 1:1 filament isolation transformer is wired into the set.

## ACTIVATE MODE

The activate mode of the Model 466 comprises a mild form of rejuvenation and can be used to increase the emission of some picture tubes when the emission has decreased below the acceptable level. All tubes with low emission cannot be activated—it depends on the condition of the cathode emission surface in the particular tube.

During the activate mode, the heater voltage of the tube is increased, while the emission current flow is maintained. The relative cathode emission can be observed on the meter of the 466 as the tube is activated. Note: Activation of in-warranty color tubes should not be performed.

### Activate Procedure

1. After completing normal test steps ① thru ⑦, note emission reading, then rotate function knob back to ② and adjust heater voltage to a value 40% above value specified in setup chart. (Example: If setup chart specified 6.3 v., adjust heater to  $1.4 \times 6.3 \text{ v.} = 8.8 \text{ v.}$ )



2. Rotate function knob to position (7) and note emission reading on meter. Allow the CRT to activate for 5 minutes, while noting the meter deflection. If the pointer moves upward and stabilizes at a higher reading, it is probable that the tube has been activated to the extent possible.
3. Rotate function knob to OFF and wait one minute. Repeat normal steps (2), (3) and (4).

NOTE: Picture tube leakage reading may change after the tube is activated. Allow tube to cool a few minutes until original leakage reading is restored, then perform steps (5), (6) and (7) and note emission reading. If emission is still too low and CRT is out-of-warranty, consider performing Rejuvenation Procedure outlined below.

## **RESTORING EMISSION**

NOTE: Any attempt to bring back the emission by rejuvenating a tube should be done very cautiously, AND ONLY AFTER IT HAS BEEN DEFINITELY DETERMINED THAT THE TUBE IS NO LONGER USEFUL IN ITS PRESENT CONDITION. When rejuvenating a Color tube, make sure you attempt rejuvenation of the defective gun only. Always follow carefully the procedure outlined below.

It is not generally advisable that you attempt rejuvenation of an "in-warranty" tube.

## **REJUVENATION**

1. Set the large function switch to the REJUVENATE 1 position.
2. When repairing a color tube, set the COLOR GUN switch to the gun that is to be rejuvenated. For a black-and-white tube, set the COLOR GUN switch in the "B/W" position. Note precisely the meter pointer position.
3. Press the red REJUVENATE button momentarily. Observe new meter needle position. Repeat step until needle deflects into GOOD area of scale (7) or until pointer deflection fails to increase from the previous reading.
4. If meter pointer fails to indicate in GOOD area after Step 3, rotate large function knob to REJUVENATE 2 position, wait 15 seconds for heater

to come up to its new operating temperature, note new meter reading, then momentarily press red REJUVENATE pushbutton. Repeat step until meter reading fails to increase. Do not continue the REJUVENATE process beyond the point where the meter needle ceases to indicate increased relative emission after each release of the REJUVENATE pushbutton.

5. If Steps 3 and 4 (which provide an automatically timed rejuvenate cycle) did not bring the cathode emission to the acceptable level, you have the option of proceeding to the SUPER REJUVENATE step. This last step is manually controlled in duration by the red REJUVENATE pushbutton, when you rotate the large function knob into the SUPER REJUVENATE position.

## **SUPER REJUVENATION**

With function switch in SUPER REJUVENATE position note meter needle position, then press red REJUVENATE button for  $\frac{1}{4}$  to  $\frac{1}{2}$  second and release immediately. Observe new meter reading. If emission is still inadequate, wait at least 5 seconds and repeat step until emission fails to increase. Increase time of rejuvenation to 1 or 2 seconds until some improvement in emission is obtained. This SUPER REJUVENATE is not an automatically timed position, so the longer you hold down the red REJUVENATE button, the longer the SUPER REJUVENATE cycle will continue.

**DO NOT CONTINUE CYCLING IN ANY REJUVENATE STEP IF THE METER READING DECREASED SLIGHTLY AFTER THE LAST DEPRESSION OF THE RED REJUVENATE PUSHBUTTON. For a SHORTED CRT NEVER USE SUPER REJUVENATE MODE.**

**NOTE:** To avoid accidental application of REJUVENATE voltages to a normal CRT, NEVER LEAVE FUNCTION KNOB IN ANY REJUVENATE POSITION MARKED IN GOLD unless you intend to immediately perform that specific rejuvenation step.



## REPAIRING OPEN ELEMENTS

If the tube has an open  $G_1$  or  $G_2$  element, the probable cause is a bad solder connection at the base pins of the picture tube. For an open element, the first step is to try resoldering the base pins. If the tube has an open cathode, it may actually be a break in the weld between the cathode and its connecting tab or very weak emission from the cathode. First, try restoring emission as discussed in "Restoring Emission". If rejuvenation does not help, an attempt can be made to weld the cathode tab as follows:

Turn function switch to Rejuvenate 2 position. With the non-metallic handle of a screwdriver, tap the neck of the tube lightly. Carefully watch as you press the red REJUVENATE button. If the weld takes you will see a bright flash. If the weld does not take, set function knob in SUPER REJUVENATE position and press red REJUVENATE button while lightly tapping neck of CRT. If the weld takes, you will see a bright flash. IMMEDIATELY RELEASE RED PUSHBUTTON. Retest the tube to be sure it will function satisfactorily.

NOTE: When not actively using the 466, rotate the large function knob to the POWER OFF position. Do not pinch line cord between mating aluminum edge extrusions of case when closing cover.

## SETUP CHARTS

An up-to-date test chart is included with your Model 466. In order to keep your setup chart up-to-date, it is recommended that you subscribe to the B&K Chart mailing service. These mailings will occur in May and November of each year and will include all the tubes presently listed on your chart plus all new types of CRTs that have come out since the last mailing.

If you wish to take advantage of this service, remit cash, check, or money order (no COD's please) to:

B&K Division of Dynascan Corporation  
1801 West Belle Plaine Avenue  
Chicago, Illinois 60613

and you will be placed on the subscription list.



## 466 FIELD CALIBRATION

The Model 466 CRT Tester/Rejuvenator can be recalibrated as follows:

### A. HEATER VOLTAGE CALIBRATION

Equipment Needed: An accurate A.C. VOM or VTVM.

Set meter for the AC scale that gives closest full scale reading to 6.3 VAC. Connect meter leads to pins 1 and 12 of socket #1. Plug the 466 line cord into a 117 VAC outlet. Turn the large function switch to the ADJUST HEATER position. Turn the heater selector switch to 5-8 position. Turn the heater adjust pot until the VOM/VTVM reads 6.3 VAC. Adjust  $R_1$ , the heater cal trim pot until the 466 meter reads 6.3 VAC on scale (2).

### B. EMISSION CALIBRATION

Equipment Needed: A milliammeter and a 100K resistor.

Turn the 466 large function switch to the READ EMISSION position. Turn the color gun switch to the RED-B/W position. Turn the  $G_2$  pots (RED-GREEN-BLUE) to full counterclockwise positions. Set the milliammeter to a range capable of reading 300 microamperes. Connect the negative lead to pin 11 of socket #1. Connect the positive lead to one end of the 100K resistor. Connect the other end of the resistor to pin 10 of socket #1. Slowly turn the red  $G_2$  pot until the milliammeter reads  $300\mu a$ . Adjust  $R_9$ , the emission cal trim pot, until the 466 meter reads 50 on scale (5).

### C. COMPRESSION CALIBRATION

Equipment Needed: A milliammeter and a 100K resistor.

Turn the 466 large function switch to the READ EMISSION position. Turn the color gun switch to the RED-B/W position. Turn the  $G_2$  pots (RED-GREEN-BLUE) to full counterclockwise positions. Set the milliammeter to a range capable of reading 3 milliamperes. Connect the negative lead to pin 11 of socket #1. Connect the positive lead to one end of the 100K resistor. Connect the other end of the resistor to pin 10 of socket #1. Slowly turn the red  $G_2$  pot until the milliammeter reads 3ma. Adjust  $R_4$ , the compression adjust trim pot, until the 466 meter reads 100 on scale (5).

## WARRANTY SERVICE INSTRUCTIONS

1. Service information is available from the factory at the address shown below.
2. Defective parts removed from the unit which are within the warranty period should be sent to the factory prepaid with the model and serial numbers of product from which they were removed. Also, include the date your Model 466 was purchased. These parts will be exchanged at no charge.
3. If you are unable to correct a difficulty, pack the product securely (preferably double packed). A detailed list of troubles encountered must be enclosed as well as your name and address. Forward prepaid (express preferred) to the nearest B&K authorized service agency.

Contact your local B&K Distributor for the name and location of your nearest service agency, or write to

*Service Department*

**B&K DIVISION OF DYNASCAN CORPORATION**

1801 West Belle Plaine Avenue

Chicago, Illinois 60613

### WARRANTY

"B & K warrants that each product manufactured by it will be free from defects in material and workmanship under normal usage and service for a period of ninety days after its purchase new from an authorized B & K distributor. Our obligation under this warranty is limited to repairing, or replacing any product or component which we are satisfied does not conform with the foregoing warranty and which is returned to our factory or our authorized service contractor, transportation prepaid, and we shall not otherwise be liable for any damages, consequential or otherwise. *The foregoing warranty is exclusive and in lieu of all other warranties (including any warranty of merchantability), whether expressed or implied.* Such warranty shall not apply to any product or component (i) repaired or altered by anyone other than B & K or its authorized service contractor (except normal tube replacement) without B & K's prior written approval; (ii) tampered with or altered in any way or subjected to misuse, negligence or accident; (iii) which has the serial number altered, defaced or removed; or (iv) which has been improperly connected, installed or adjusted otherwise than in accordance with B & K's instructions. B & K reserves the right to discontinue any model at any time or change specifications or design without notice and without incurring any obligation. *The warranty shall be void and there shall be no warranty of any product or component if a B & K warranty registration card is not properly completed and postmarked to the B & K factory within five days after the purchase of the product new from an authorized B & K distributor.*"







DYNASCAN CORPORATION

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